DEPARTMENT OF NATIONAL DEFENCE
CANADA

OPERATIONAL RESEARCH DIVISION

DIRECTOR OPERATIONAL RESEARCH (Corporate, Air & Maritime)
PERSONNEL OPERATIONAL RESEARCH TEAM
and
DIRECTORATE OF STRATEGIC HUMAN RESOURCE COORDINATION

DOR(CAM) RESEARCH NOTE RN2001/02

FIRST TERM NCM ATTRITION IN THE 1990's

by

T.E. Wentzell
and
Dr A. Jesion

February 2001

OTTAWA, CANADA

National Defence Défense nationale

OPERATIONAL RESEARCH DIVISION

CATEGORIES OF PUBLICATION

ORD Reports are the most authoritative and most carefully considered publications of the DGOR scientific community. They normally embody the results of major research activities or are significant works of lasting value or provide a comprehensive view on major defence research initiatives. ORD Reports are approved personally by DGOR, and are subject to peer review.

ORD Project Reports record the analysis and results of studies conducted for specific sponsors. This Category is the main vehicle to report completed research to the sponsors and may also describe a significant milestone in ongoing work. They are approved by DGOR and are subject to peer review. They are released initially to sponsors and may, with sponsor approval, be released to other agencies having an interest in the material.

Directorate Research Notes are issued by directorates. They are intended to outline, develop or document proposals, ideas, analysis or models which do not warrant more formal publication. They may record development work done in support of sponsored projects which could be applied elsewhere in the future. As such they help serve as the corporate scientific memory of the directorates.

ORD Journal Reprints provide readily available copies of articles published with DGOR approval, by OR researchers in learned journals, open technical publications, proceedings, etc.

ORD Contractor Reports document research done under contract of DGOR agencies by industrial concerns, universities, consultants, other government departments or agencies, etc. The scientific content is the responsibility of the originator but has been reviewed by the scientific authority for the contract and approved for release by DGOR.

102-01793/

DEPARTMENT OF NATIONAL DEFENCE

CANADA

OPERATIONAL RESEARCH DIVISION

&

DIRECTORATE OF STRATEGIC HUMAN RESOURCE COORDINATION

DOR (CAM) RESEARCH NOTE RN2001/02

FIRST TERM NCM ATTRITION IN THE 1990's

by

T.E. Wentzell
and
Dr A. Jesion

Recommended by:

Team Leader,
Personnel Operational
Research Team

Approved by:

Director,
Operational Research
(Corporate, Air, Maritime)

The contents are the responsibility of the issuing authority and publication by DOR(CAM) does not necessarily reflect the official position of the Department of National Defence.

OTTAWA, CANADA

February 2001

ABSTRACT

This paper documents the analysis carried out to provide Canadian input to The Technical Cooperation Program (TTCP) with respect to determining first term attrition rates for Non Commissioned Members (NCMs) in the Canadian Forces (CF). First term attrition is taken to mean release from the CF during the first three years of service (YOS). Data from the past decade indicate that approximately 30% of NCMs leave the CF before completing 3 YOS - a result comparable to the US experience. Also, it appears that female NCM attrition rates are higher than corresponding male NCM attrition rates in the first three YOS.

RÉSUMÉ

Ce document expose en détail l'analyse effectuée pour déterminer, à titre d'apport canadien au Programme de coopération technique (PCOT), les taux d'attrition en période de service initiale des militaires du rang (MR) des Forces canadiennes (FC). L'expression « attrition en période de service initiale » désigne les libérations qui surviennent au cours des trois premières années de service. Les données des dix dernières années indiquent qu'à peu près 30 p. 100 des MR quittent les FC avant d'avoir terminé trois années de service - un bilan comparable aux résultats compilés aux États-Unis. Il semble également qu'au cours des trois premières années de service, les taux d'attrition des MR féminins sont proportionnellement plus élevés que ceux de leurs collègues masculins.

TABLE OF CONTENTS

	Page No.
ABSTRACT/RÉSUMÉ	i
TABLE OF CONTENTS	ii
INTRODUCTION	1
Aim	1
Data Source	1
Caveats	2
ANALYSIS METHOD	3
RESULTS	5
All NCMs	4
Male NCMs	7
Female NCMs	9
Suggestions for Other Analyses	11
SUMMARY AND CONCLUDING REMARKS	12
REFERENCES	13
DOCUMENT CONTROL SHEET	

FIRST TERM NCM ATTRITION IN THE 1990's

INTRODUCTION

1. The Director Strategic Human Resource Coordination (DSHRC) chairs Technical Panel HUM-TP3 "Military Human Resource Issues" under the "Human Resources and Performance" Group of The Technical Cooperation Program (TTCP). In this capacity, she coordinates the exchange of information between TTCP nations (Canada, the United States, the United Kingdom, Australia and New Zealand) in a variety of related subject areas. One of the continuing research interests of this panel is military attrition (and the related issue of retention). TTCP nations regularly exchange information about both quantitative and qualitative aspects of military attrition and retention. The information reported in this paper was requested through the TTCP HUM-TP3 forum.

2. In the US, enlisted contracts can be 2, 3, 4 and in some circumstances 6 years. There, military attrition research is focused on the "first term" which is usually defined for analysis purposes as the first 36 months. Reference 1 is a US request for information concerning Canada's experience with "first term" attrition for Non Commissioned Members (NCMs) for the past ten years. It was also requested that factors such as gender and race/ethnic group be considered as well. A summary statement on attrition in the US military (Reference 2) indicates that "historically", the US Services have lost about 30% of recruits over the first three years of service, with most leaving during initial entry training.

Aim

3. The aim of this paper is to collect, organize and analyze first term NCM attrition data over the past decade as a Canadian contribution to the exchange of attrition information through TTCP HUM-TP3.

Data Source

4. The analysis reported in this paper is based on data contained in the Personnel Operational Research Team (PORT) Strategic Database which is a compendium of filtered data obtained over the past several years from various sources within the Human Resources Group at National Defence Headquarters.

5. Reference 3 describes the design intent and contents of the PORT Strategic Database. It was developed as a tool to assist Human Resource (HR) operational research analysts with the construction of HR simulation models that replicate the career flows of military personnel through an occupational structure. These models require "rules" for attrition flows (among others) and these are developed from the analysis of historical patterns of attrition. The PORT Database has become a valuable tool to address other research taskings, but the database contents are not guaranteed to be 100% accurate.

6. The PORT Database includes two tables of relevance to first term attrition. Its Population Table is derived from "snapshots" of the Canadian Forces (CF) as of April 1 of each year. For modeling purposes, these snapshots are used to represent the CF population for the whole fiscal year. That is, the population of the CF on April 1st of a given year *x* is used to represent the population of the CF for April 1st, year *x* to March 31st, year *x+1*.

7. The Release Table in PORT's Database is derived from information on CF releases that occur throughout the fiscal year - using a definition similar to that described above. That is, year *x* releases refer to CF releases that occur between April 1st, year *x* and March 31st, year *x+1*.

8. The Directorate of Human Resource Information Management (DHRIM) should be consulted for definitive attrition data, although historical information prior to the departmental record management conversion to PeopleSoft in 1997 may be problematic. The PORT Database contains CF strength and release records dating back to 1982 and this readily accessible source of historical data has proven invaluable to HR analysts.

Caveats

9. The PORT Database is updated from departmental sources every six months and this means that those personnel who leave the CF very quickly (e.g. early "training failures") may never be included. Thus, the Release Table in PORT's Database may under report attrition for personnel with less than one Year of Service (YOS < 1).

10. However, each release record that is received by PORT is incorporated into the database and some "training failures" are indeed captured. In some cases an individual that does not appear in the Population Table may appear in the release data received by PORT. Since an individual must be in the population in order to be released, PORT analysts created single population records for these individuals, dated with the fiscal year in which the release occurred so that the enrollment history of such individuals is not lost.

11. As some records are incomplete, different database queries may have discrepancies if a field in the record is missing or incorrect. For example, total releases for a given year may not exactly equal the sum of male and female releases for exactly the same year because of missing fields in the original database. To the greatest extent possible, these errors are being eliminated as they are detected but the results given in this paper do contain such cases.

ANALYSIS METHOD

12. This analysis reports attrition by start year cohort. Therefore, care was taken to keep track of how many personnel enter the CF in each start year of the past decade and to determine how many personnel from each cohort remain after each subsequent YOS. Microsoft Access Queries were used to identify individuals in the Population Table with 0 YOS in year *x*. Since the year *x* population data is a snapshot of the population as of April 1st of that year, individuals with 0 YOS would have joined the CF between April 2nd, year *x-1* and April 1st, year *x*. Thus, these individuals represent the start year cohort for the fiscal year *x-1*. That is, individuals with 0 YOS in 1991 represent the enrollments of the Fiscal Year 1990/91, while those with 0 YOS in 1992 represent the enrollments of 1991/92, etc.

13. All releases were grouped by year of release to focus on the past ten years. The cohort year *x* refers to the Fiscal Year *x / x+1*, i.e. reflecting releases for the period April 1, year *x* through March 31, year *x+1*. This nomenclature applies to each year, ending at 1999 - the fiscal year ending March 31, 2000. This is the last complete year in the PORT Database.

14. Within the PORT Database, the first group of release records that correspond to releases for individuals joining the CF in year *x* (that is, individuals with 0 YOS in the population data for year *x+1*) are those of year *x+1*. In other words, for individuals joining the CF between April 2nd, year *x* and April 1st, year *x+1*, the first possible record of their release would be indicated by a release record dated between April 1st, year *x+1* and March 31st, year *x*+2. Depending on when the individual joined the CF, he/she could have between 0 and 1 completed YOS at this time.

15. By examining entry year data fields, releases were correlated with their cohort year. The numbers of releases in each cohort year were accumulated, keeping track of both absolute numbers and percentages. (In some years, relatively few personnel are recruited and this contributes to variability in attrition probability.) Survivor curves were developed by accumulating release probabilities for each cohort using YOS as the time variable.

16. The above process was repeated three times, once for the entire NCM database and then for both male and female sub-populations. Results were both tabulated and plotted to look for attrition patterns.

17. Using each cohort as an "independent sample", mean values were calculated for the probability of being released during the first through fourth year in the CF, i.e. for 0-1, 1-2, 2-3 and 3-4 completed YOS. Standard deviations were also calculated.

RESULTS

All NCMs

18. Table I displays the start populations (i.e. new intake) for each NCM cohort during the 1990's. During the period 1992 to 1996, certain occupations were subject to the Forces Reduction Program (FRP). The FRP years were also years of reduced intake.

19. At this point in time, insufficient time has passed for any members in the 1997 cohort to have three completed years of service upon release - thus there is a blank in the final column of Table I for this cohort. Continuing in this manner, Table I has two blank entries for the 1998 cohort and three blank entries for the 1999 cohort.

20. The release numbers of Table I have been converted to show the percentage of each intake cohort remaining in the CF after each YOS in Table II. Taking each cohort as an "independent observation", mean values and standard deviations for each YOS are also shown. The mean values shown in Table II have been plotted in Figure 1. This chart shows the probability of retaining a NCM in the CF during their first year of service and afterwards for 0-1, 1-2, 2-3 and 3-4 completed YOS - averaged over the past decade.

21. Analysis of NCM releases, based on the contents of the PORT Database, show that approximately 75% of NCMs remain in the CF after completing 3 YOS. Cohort survivor rates over three years range from 70% to 79%. Taking into account that the PORT Database does not capture all "early" training failures, it is estimated that the "true" first term attrition rate is at least 30% over the first three YOS.

TABLE I

Cumulative Releases for all NCMs
in their First Three Years of Service

Intake Cohort	Start Population*	Cumulative Releases			
		YOS** 0-1	YOS** 1-2	YOS** 2-3	YOS** 3-4
1990	4507	379	714	1153	1320
1991	1777	192	241	450	525
1992	956	39	124	207	243
1993	1376	88	129	236	285
1994	1368	78	107	255	315
1995	1298	87	151	290	313
1996	3441	384	446	748	-
1997	1218	32	101	-	-
1998	756	73	-	-	-

TABLE II

Survivor Rates for all NCMs
in their First Three Years of Service

Intake Cohort	Start Population*	Percentage of Cohort Remaining in the CF			
		YOS** 0-1	YOS** 1-2	YOS** 2-3	YOS** 3-4
1990	4507	92	84	74	71
1991	1777	89	86	75	70
1992	956	96	87	78	75
1993	1376	94	91	83	79
1994	1368	94	92	81	77
1995	1298	93	88	78	76
1996	3441	89	87	78	-
1997	1218	97	92	-	-
1998	756	90	-	-	-
Mean		**93**	**88**	**78**	**75**
Standard Deviation		**3**	**3**	**3**	**4**

* Each start population refers to intake (i.e. new recruits) during the fiscal year ending 31 March of the following calendar year.
** Refers to complete YOS.

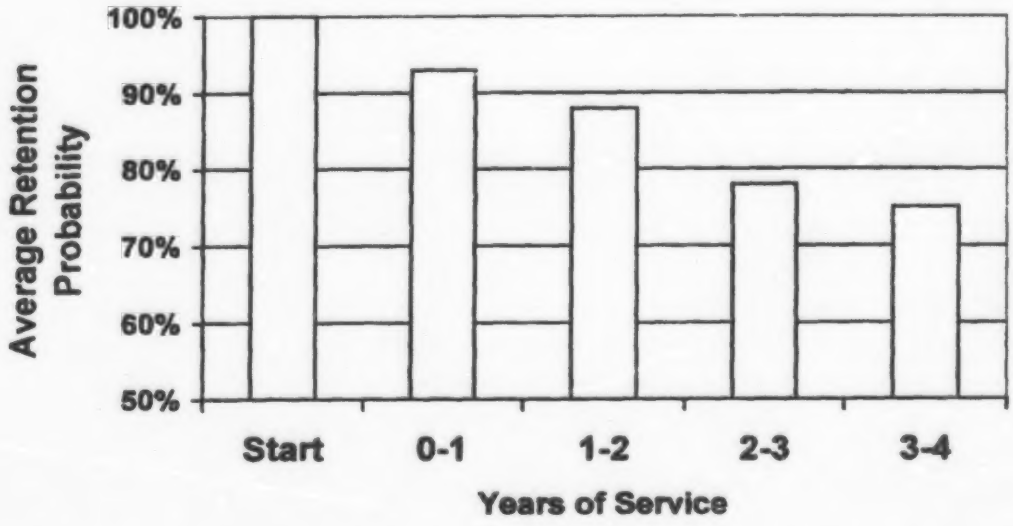

Figure 1 - Average Retention Probability for all NCMs in the CF (1990/1991 - 1998/1999)

Male NCMs

22. Table III displays the start populations (i.e. new intake) for each NCM cohort during the 1990's for males only. The male NCM sub-population is the large majority of all NCMs recruited over the past decade. However, during the FRP years, reductions of intake affected males slightly more than females (on a percentage basis). As was noted previously, there are blank entries in certain location in Table III because insufficient time has passed for members in recent cohorts to achieve all possible YOS levels.

23. Table IV follows the format of Table II and shows the percentage of each male NCM intake cohort remaining in the CF after each YOS. Taking each cohort as an "independent observation", mean values and standard deviations for each YOS are also shown. As the large majority of NCMs are male, these results are virtually the same as those reported in paragraph 21. Approximately 75% of male NCMs remain in the CF after completing 3 YOS. Cohort survivor rates over three years range from 71% to 80%. It is estimated that the "true" first term attrition rate is at least 30% (over the first three YOS) because the PORT Database does not capture all "early" releases.

TABLE III

Cumulative Releases for all Male NCMs
in their First Three Years of Service

Intake Cohort	Start Population*	Cumulative Releases			
		YOS** 0-1	YOS** 1-2	YOS** 2-3	YOS** 3-4
1990	3742	312	577	959	1095
1991	1541	147	189	374	437
1992	879	37	111	182	213
1993	1296	78	113	215	262
1994	1312	75	104	248	304
1995	1212	79	138	268	290
1996	3067	355	410	681	-
1997	1062	28	83	-	-
1998	675	62	-	-	-

TABLE IV

Survivor Rates for all Male NCMs
in their First Three Years of Service

Intake Cohort	Start Population*	Percentage of Cohort Remaining in the CF			
		YOS** 0-1	YOS** 1-2	YOS** 2-3	YOS** 3-4
1990	3742	92	85	74	71
1991	1541	90	88	76	72
1992	879	96	87	79	76
1993	1296	94	91	83	80
1994	1312	94	92	81	77
1995	1212	93	89	78	76
1996	3067	88	87	78	-
1997	1062	97	92	-	-
1998	675	91	-	-	-
Mean		**93**	**89**	**78**	**75**
Standard Deviation		**3**	**3**	**3**	**3**

* Each start population refers to intake (i.e. new recruits) during the fiscal year ending 31 March of the following calendar year.
** Refers to completed YOS.

Female NCMs

24. Table V displays the start populations (i.e. new intake) for each NCM cohort during the 1990's for females only. The female NCM sub-population is a small minority of all NCMs recruited over the past decade. As was noted previously, there are blank entries in certain location in Table V because insufficient time has passed for members in recent cohorts to achieve all possible YOS levels.

25. Table VI follows the format of Tables II and IV and shows the percentage of each female NCM intake cohort remaining in the CF after each YOS. Taking each cohort as an "independent observation", mean values and standard deviations for each YOS are also shown.

TABLE V

Cumulative Releases for all Female NCMs
in their First Three Years of Service

Intake Cohort	Start Population*	Cumulative Releases			
		YOS** 0-1	YOS** 1-2	YOS** 2-3	YOS** 3-4
1990	690	66	136	193	224
1991	236	45	52	76	88
1992	77	2	13	25	30
1993	79	10	16	21	23
1994	56	3	3	7	11
1995	73	8	13	22	23
1996	360	29	36	67	-
1997	156	4	18	-	-
1998	81	11	-	-	-

* Each start population refers to intake (i.e. new recruits) during the fiscal year ending 31 March of the following calendar year.
** Refers to completed YOS.

TABLE VI

Survivor Rates for all Female NCMs
in their First Three Years of Service

Intake Cohort	Start Population*	Percentage of Cohort Remaining in the CF			
		YOS** 0-1	YOS** 1-2	YOS** 2-3	YOS** 3-4
1990	690	90	80	72	68
1991	236	81	78	68	63
1992	77	97	83	68	61
1993	79	87	80	73	71
1994	56	95	95	88	80
1995	73	89	82	70	68
1996	360	92	90	81	-
1997	156	97	88	-	-
1998	81	86	-	-	-
Mean		**90**	**85**	**74**	**69**
Standard Deviation		**5**	**6**	**7**	**7**

* Each start population refers to intake (i.e. new recruits) during the fiscal year ending 31 March of the following calendar year.
** Refers to completed YOS.

26. The mean values shown in Tables IV and VI have been plotted in Figure 2. This chart represents the probability of retaining either a male or female NCM in the CF during their first year of service and afterwards for 0-1, 1-2, 2-3 and 3-4 completed YOS - averaged over the past decade. Please note that although the retention rates appear to be higher for the male NCM sub-population, the standard deviations for the female NCM results are substantially higher than the corresponding standard deviations for the male NCM sub-population. This volatility can be attributed to the smaller (absolute) numbers of female NCM releases.

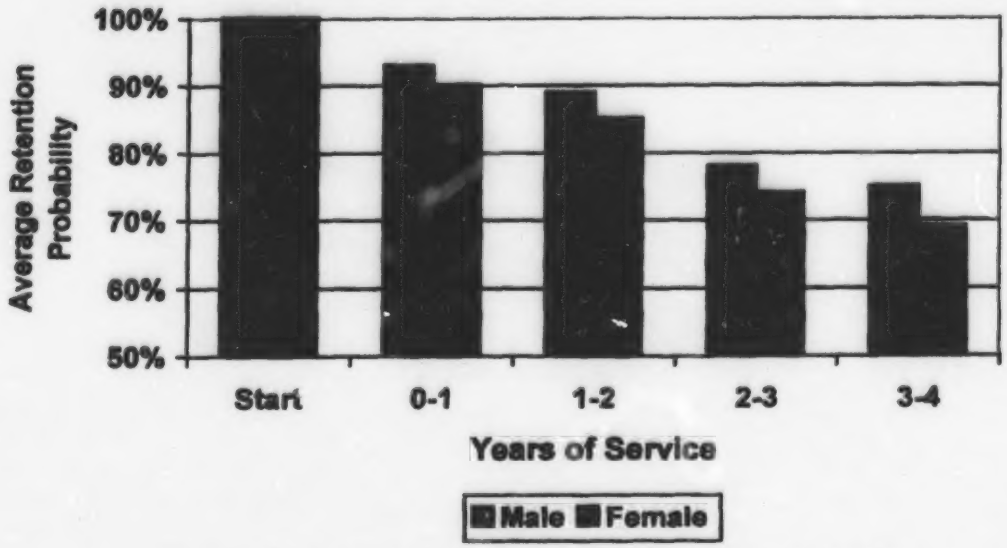

Figure 2 - A Comparison of Average Retention Probability Between Male and Female NCMs (1990/1991 - 1998/1999)

Suggestions for Other Analyses

27. At this time, it is not possible to extend the analysis to include racial/ethnic factors, as these have not been included in the PORT Database. The collection of such information may be problematic and involve quite small sample sizes.

28. Other extensions however are easily accomplished - such as widening the time horizon to look at retention over a period of time greater than three completed years of service. The "down side" to this would be the requirement to go further back into historical records to have enough cohorts to generate useful averages.

29. Another possible study would be the analysis of officer cohort retention. This could be done in the same manner as for the NCM population, using Microsoft Access queries similar to those already developed for the NCM analysis. However, in the officer attrition analysis, other factors such as commissioning plan and years of commissioned service (as opposed to YOS) may have an effect on retention probability that is worth investigating.

30. The PORT Database requires better data on early training losses, particularly for members with less than 1 YOS. As several initiatives are underway within the HR Group to improve the quality of recruitment and attrition monitoring, this situation is expected to improve shortly.

SUMMARY AND CONCLUDING REMARKS

31. This research activity was undertaken in response to a US request for information through the TTCP. Using the PORT Database, retention data were compiled over the past decade in order to calculate the probability of retaining NCMs in the CF through their first three completed years of service.

32. The results indicate that approximately 30% of NCM recruits have left the CF by the time their cohort completes three years of service. This appears to be consistent with the US experience.

33. Early attrition in the female NCM population appears to be higher than in the male NCM population, although not drastically so. This also appears to be in agreement with the US experience.

34. Given the difficulty of recruiting in today's climate, such high loss rates may be unacceptable to the CF. Measures that reduce early attrition (such as better selection instruments, more realistic job profiles, etc.) can help to alleviate these problems.

REFERENCES

1. Email from "Arabian, Jane, Dr., OSD/P&R" <arabianj@pr.osd.mil> dated Tue, 19 Dec 2000 14:01:41.

2. Statement of Honorable Alphonso Maldon Jr., Assistant Secretary of Defense (Force Management Policy) before the Personnel Subcommittee Senate Committee on Armed Services on Military Recruiting and Retention, 24 February 2000.

3. Kerzner, L.F., Jesion, Dr A. and Chan, Dr G.H., A Strategic Personnel Database for Desktop Computers, DOR(CAM) Research Note RN-9801, February 1998.

UNCLASSIFIED
SECURITY CLASSIFICATION OF FORM

DOCUMENT CONTROL DATA
(Security classification of title, body of abstract and indexing annotation must be entered when the overall document is classified)

1 ORIGINATOR (the name and address of the organization preparing the document Organizations for whom the document was prepared e g Establishment Sponsoring a contractor's report, or tasking agency, are entered in Section 8)

PERSONNEL OPERATIONAL RESEARCH TEAM, ADM HR-Mil, NATIONAL DEFENCE HQ, OTTAWA, CANADA, K1A 0K2

2 SECURITY CLASSIFICATION (overall security classification of the document, including special warning terms if applicable)

Unclassified

3 TITLE (the complete document title as indicated on the title page Its classification should be indicated by the appropriate abbreviation (S, C or U) in parentheses after the title)

FIRST TERM NCM ATTRITION IN THE 1990's (U)

4 AUTHORS (last name, first name, middle initial)

Wentzell, T.E., and Jesion, Dr A.

5 DATE OF PUBLICATION (month Year of Publication of document)

February 2001

6a NO OF PAGES (total containing information Include Annexes, Appendices, etc.)

13

6b NO OF REFS (total cited in document)

3

7. DESCRIPTIVE NOTES (the category of document, e.g technical report, technical note or memorandum If appropriate, enter the type of report e g interim, progress, summary, annual or final Give the inclusive dates when a specific reporting period is covered)

Research Note

8 SPONSORING ACTIVITY (the name of the department project office or laboratory sponsoring the research and development. Include the address)

Chief of Staff ADM HR-Mil

9a PROJECT OR GRANT NO. (if appropriate, the applicable research and development project or grant number under which the document was written Please specify whether project or grant)

NIL

9b CONTRACT NO. (if appropriate, the applicable number under which the document was written)

NIL

10a ORIGINATOR's document number (the official document number by which the document is identified by the originating activity This number must be unique to this document)

DOR(CAM) RESEARCH NOTE RN2001/02

10b OTHER DOCUMENT NOS (Any other numbers which may be assigned this document either by the originator or by the sponsor.)

11 DOCUMENT AVAILABILITY (any limitations on further dissemination of the document, other than those imposed by security classification)

(X) Unlimited distribution
( ) Distribution limited to defence departments and defence contractors further distribution only as approved
( ) Distribution limited to defence departments and Canadian defence contractors, further distribution only as approved
( ) Distribution limited to government departments and agencies; further distribution only as approved
( ) Distribution limited to defence departments, further distribution only as approved
( ) Other (please specify)

12. DOCUMENT ANNOUNCEMENT (any limitation to the bibliographic announcement of this document This will normally correspond to the Document Availability (11) However, where further distribution (beyond the audience specified in 11) is possible, a wider announcement audience may be selected)

UNCLASSIFIED
SECURITY CLASSIFICATION OF FORM

13 ABSTRACT (a brief and factual summary of the document It may also appear elsewhere in the body of the document itself. It is highly desirable that the abstract of classified documents be unclassified Each paragraph of the abstract shall begin with an indication of the security classification of the information in the paragraph (unless the document itself is unclassified) represented as (S), (C), or (U) It is not necessary to include here abstracts in both official languages unless the text is bilingual)

This paper documents the analysis carried out to provide Canadian input to The Technical Cooperation Program (TTCP) with respect to determining first term attrition rates for Non Commissioned Members (NCMs) in the Canadian Forces (CF). First term attrition is taken to mean release from the CF during the first three years of service (YOS). Data from the past decade indicate that approximately 30% of NCMs leave the CF before completing 3 YOS - a result comparable to the US experience. Also, it appears that female NCM attrition rates are higher than corresponding male NCM attrition rates in the first three YOS.

14 KEYWORDS, DESCRIPTORS or IDENTIFIERS (technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required Identifiers, such as equipment model designation, trade name, military project code name, geographic location may also be included If possible keywords should be selected from a published thesaurus, e.g Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus-identified . If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title)

Attrition
Retention
Military Human Resources
Non Commissioned Members
Personnel Databases
Operational Research and Analysis